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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Masatoshi FUJIMOTO et al.

Application No.: 10/076,273

Filed: February 19, 2002

For: RADIOISOTOPE GENERATING
APPARATUS

Commissioner for Patents
Washington, D.C. 20231

Sir:

Group Art Unit: 3641

Examiner: J. Richardson

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RESPONSE AND REQUEST FOR RECONSIDERATION

In response to the Office Action dated August 13, 2002 (Paper No. 3), the period for response to which extends through February 13, 2003 by the concurrently filed request for a three-month extension of time and corresponding fee payment, reconsideration and withdrawal of the rejections set forth in the pending Office Action are respectfully requested in light of the following remarks.

Summary of the Office Action

In the Office Action, the specification is objected to under 35 U.S.C. § 112, first paragraph, as allegedly failing to provide an adequate written description of the invention and as failing to adequately teach how to make and/or use the invention. Claims 1 and 2 stand rejected under 35 U.S.C. § 101 because the disclosed invention is allegedly inoperative and therefore lacks utility. Claims 1 and 2 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly

containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1 and 2 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1 and 2 stand rejected under 35 U.S.C. § 112, first paragraph, because the best mode contemplated by the inventor has allegedly not been disclosed. Claims 1 and 2 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Whittlesey (U.S. Patent No. 3,378,446) (hereinafter "Whittlesey"). Claim 1 stands rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Hedstrom (U.S. Patent No. 3,762,992) (hereinafter "Hedstrom").

Rejections under 35 U.S.C. §§ 112, first paragraph and 101

The specification is objected to under 35 U.S.C. § 112, first paragraph, as allegedly failing to provide an adequate written description of the invention and as failing to adequately teach how to make and/or use the invention. Claims 1 and 2 stand rejected under 35 U.S.C. § 101 because the disclosed invention is allegedly inoperative and therefore lacks utility. Claims 1 and 2 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1 and 2 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the

application was filed, had possession of the claimed invention. Claims 1 and 2 stand rejected under 35 U.S.C. § 112, first paragraph, because the best mode contemplated by the inventor has allegedly not been disclosed. These objections and rejections under 35 U.S.C. § 112, first paragraph and 35 U.S.C. § 101 are respectfully traversed for at least the following reasons.

The Office Action rejects claims 1 and 2 under 35 U.S.C. § 112, first paragraph at page 8, paragraph 10, alleging that regarding claim 1, there is no proper support in the original disclosure for claimed nuclear reaction based on source materials disclosed (natural water) for using a laser optical system as the irradiating means. Applicants respectfully traverse this rejection for reasons set forth below in the discussion which follows and also because the specification teaches these particular features at least at page 10, lines 17-24, page 13, lines 7-18 and in the Summary of the Invention at pages 3-5.

At page 3, paragraph 7, the Office Action alleges that there "is no reputable evidence of record to support the allegations or claims that the invention is capable of operating as indicated in the specification..." In response, Applicants respectfully submit that the present invention currently recited in claims 1 and 2 is fully described in the specification as originally filed, as discussed further below. Moreover, Applicants respectfully submit that the description in the specification as originally filed is sufficient to enable one skilled in the subject art to make and/or use the present invention, as recited in claims 1 and 2, for at least the following reasons.

The Office Action, at page 4 alleges that the instant "specification contains assumptions and speculation as to how in what manner, the invention will operate." This portion of the Office Action goes on to allege that Applicants "[appear] to be basing the operativeness of [their] invention on various approximations, estimations, assumptions, etc., as set forth, for example, on the following pages." The Office Action then goes on to cite particular portions of the

specification to support these allegations. Applicants respectfully respond to these Office Action assertions as follows.

1) Page 8, lines 2 to 5:

The Office Action points to this portion of the specification as “stating that the nuclear reaction field is always small.” In response, Applicants respectfully submit that, as described in the specification, a region in which the described nuclear reaction occurs is very small. This means that in order to effectively cause the reaction to occur, the intensity of the laser should be increased by narrowing the laser beam to as small a spot size as possible.

2) Page 9, lines 15, 16:

The Office Action points to this portion of the specification as “stating that whole or part of the optical laser system can be incorporated as the occasion demands without defining what such occasions may consist.” In response, Applicants respectfully submit, for example, that the provision of a transparent window in a high intensity light transmission path can cause a problem in that the window is destroyed when the intensity of the laser becomes too large. In such case, a system which does not incorporate such a transparent window in the transmission path should be used. In other words, the laser transmission path should be within a vacuum chamber in whole or in part in this situation. Applicants respectfully submit that such an arrangement is commonly understood to those skilled in the subject art of treating high intensity lasers. Accordingly, such concepts do not need to be further described in the instant specification.

3) Page 17 and page 18, lines 11+:

The Office Action points to this portion of page 17 of the specification as "stating that when water is the target material source, N-13 is produced and other materials such as nitric oxide, ammonia and nitrogen molecules adhere to copper surfaces." The Office Action cites to page 18, lines 11+ as "stating that collecting means are provided for discriminating and collecting only necessary P-1 molecules." The Office Action alleges that "[t]here is no evidence of record for making these assumptions."

In response, Applicants respectfully submit that the laser used in an embodiment of the instant invention emits a light pulse having 200 mJ of energy and 30 fs of a pulse width has about 7 TW at an instantaneous maximum output. Such a large amount of energy can be realized as a result of recent developments in laser technology with comparative ease. Along the lines of the foregoing discussion, for example, when a spot size of the laser is narrowed to be about 10 μm at a converging point, the intensity of the laser at this converging point reaches to 10^{18} to 10^{19} W/cm^2 . Applicants respectfully submit that it is well-known to those skilled in the subject art that in such high intensity regions, a nuclear reaction can easily occur. The fact that D-T reactions are the only reaction type generally discussed is because the threshold of such a D-T nuclear reaction is low. As a result, D-T reactions are most effective as a reaction type for picking up energy therefrom. An object of the present invention, on the other hand, is to produce a useful radioactive isotope. As a result, a different reaction type is utilized in the present invention. Applicants respectfully submit that this other reaction type can also be utilized as a matter of course in accordance with the teachings in the disclosure of the instant application.

Along these lines, the Office Action, at page 4, lines 1-6 asserts that "it is well known to [use] laser energy in optical surgery techniques for repairing tears on human eye retina and in

these procedures the laser light photons are in contact with water containing materials such as water in tear eye ducts and ~~the~~ vitreous humor of the eye.” The Office Action goes on to allege that “[b]ased on these procedures there is no evidence that radioisotopes are produced by laser energy passing through such water sources.” In response, Applicants respectfully submit that the lasers described in association with the instant invention are not used for such eye treatment etc., as described in the above-cited portion of the Office Action. Applicants respectfully traverse the Office Action’s assertion in this regard that the nuclear reactions described in the embodiments of the instant invention could not occur because the laser used in such eye treatments does not produce any radioactive isotope. Applicants respectfully submit that one having ordinary skill in the subject art would certainly realize that the generated nitrogen combines with oxygen, hydrogen or other nitrogen in the atmosphere to form nitrogen oxide, ammonia or nitrogen molecules, as described in the specification.

4) Page 18, lines 21+:

The Office Action points to this portion of the specification as “stating that a specific type and thickness of radiation shielding is provided without stating what are the controlling radionuclides in this respect.” In response, Applicants respectfully submit that, for example, the above described nuclear species is generated. However, in another reaction, an additional nuclear species is generated. Applicants respectfully submit that the shielding method that is needed is dependent on the type of nuclear species generated, as a matter of course, and consistent with the general knowledge of those skilled in the subject art.

5) Page 22, lines 19+:

The Office Action points to this portion of the specification as “stating optimal molecule cluster size for inducing efficient nuclear reaction.” The Office Action then goes on to state, however, that “[t]here is no basis provided for defining what is considered an efficient nuclear reaction, nor any basis for establishing the operating parameters for establishing the basis for optimal molecule cluster size.”

In response, Applicants respectfully submit that the specification discloses that the nuclear reaction occurs by the impact of nuclei forming a cluster in a process in which the nuclei fly in all directions at ultra high speed by a Coulomb explosion. It is important in such nuclear reactions to make the laser energy absorption efficiency of the cluster as large as possible. Applicants respectfully submit that it is well known by those having skill in the subject art that the energy absorption efficiency is large when the size of cluster approaches a wavelength of the laser.

6) Page 24, lines 12+:

The Office Action points to this portion of the specification as “stating that a range of particles, such as alpha’s, neutrons, photons are generated by the alleged nuclear reaction, without providing evidence of the operating mechanisms for producing such charged particles.”

In response, Applicants respectfully submit that, it is well known by those having skill in the subject art that such particles are generated when a nuclear reaction occurs. The specification describes various examples associated with the disclosed nuclear reactions.

7) Page 24, lines 17-24:

The Office Action points to this portion of the specification as “stating that a monitoring and controlling means are required for example, for neutrons and photons, without defining what types and in what manner such monitoring and controlling operations are achieved.”

In response, Applicants respectfully submit that because a detection method of detecting neutrons and γ rays is well known to those having skill in the subject art, the specification need not describe such detection methods in further detail.

8) Page 31, lines 8+:

The Office Action points to this portion of the specification as “stating that a time of one nanosecond is necessary for operating the applicant’s device, without providing the theoretical basis for such a time period and without defining the means for achieving such time periods of operation.”

In response, Applicants respectfully submit that it is well known to those having skill in the subject art that it takes up to about a nanosecond before the formation of a cluster of material ejected into vacuum space reaches an equilibrium state. Moreover, Applicants submit that because this is a process relating to the movement of material, the required time does not decrease. It is possible to introduce material before laser irradiation by synchronizing the introduction of the material with one prior pulse of laser. Applicants respectfully submit that synchronizing in this way is a method that is well known to those having skill in the subject art, and therefore the Applicants respectfully submit that the specification need not describe such a method in further detail.

9) Page 33, line 12, Page 35, lines 3 to 8:

The Office Action points to this portion of the specification as “introducing a series of nuclear reaction equations without providing any basis for claiming that the applicant’s invention can result in such nuclear reactions.”

In response, Applicants respectfully submit that it appears that the Office Action intended to refer to page 34, lines 3 to 8 instead of page 35, lines 3 to 8. Nevertheless, Applicants respectfully submit that such a nuclear reaction is well known to those having skill in the subject art associated with nuclear accelerating device experimentation. Further, as described in the specification and in the foregoing discussion, Applicants respectfully submit that such a nuclear action does result from the concepts associated with the present invention, as described in the specification and recited in claims 1 and 2.

The Office Action refers to the specific points set forth in section 7 of the Office Action throughout the various objections and rejections under 35 U.S.C. § 112, first paragraph and 35 U.S.C. § 101. For at least the foregoing reasons, Applicants respectfully submit that claims 1 and 2 and the specification fully comply with the requirements of both 35 U.S.C. § 112, first paragraph and 35 U.S.C. § 101. Accordingly, Applicants respectfully request that each of the objections and rejections under 35 U.S.C. § 112, first paragraph and 35 U.S.C. § 101, be withdrawn.

With additional regard to the Office Action’s rejection under 35 U.S.C. § 112, first paragraph at page 8, paragraph 11 alleging that the best mode contemplated by the inventor has not been disclosed and has allegedly been concealed, Applicants respectfully submit that MPEP § 2165 sets forth that “[d]etermining compliance with the best mode requirement requires a two-prong inquiry. First, it must be determined whether, at the time the application was filed, the

inventor possessed a best mode for practicing the invention. This is a subjective inquiry which focuses on the inventor's state of mind at the time of filing. Second, if the inventor did possess a best mode, it must be determined whether the written description disclosed the best mode such that a person skilled in the art could practice it. This is an objective inquiry, focusing on the scope of the claimed invention and the level of skill in the art. Eli Lilly & Co. v. Barr Laboratories, Inc., 251 F.3d 955, 963, 58 USPQ 1865, 1874 (Fed. Cir. 2001). Moreover, MPEP § 2165.03 states that the "examiner should assume that the best mode is disclosed in the application, unless evidence is presented that is inconsistent with that assumption." Even further, MPEP § 2165.03 goes on to direct that it "is extremely rare that a best mode rejection properly would be made in *ex parte* prosecution. The information that is necessary to form the basis for a rejection based on the failure to set forth the best mode is rarely accessible to the examiner..." Thus, in addition to the reasons set forth above with regard to the Applicants' traversal of the objections and rejections under 35 U.S.C. § 112, first paragraph and 35 U.S.C. § 101, Applicants respectfully traverse this "best mode" rejection even further as not being supported by proper evidence in accordance with the requirements and directions set forth in MPEP § 2165.

Rejections under 35 U.S.C. § 102(b)

Claims 1 and 2 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Whittlesey. Claim 1 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Hedstrom. These rejections are respectfully traversed for at least the following reasons.

Applicants respectfully submit that Whittlesey relates to technology in which material including deuterium or tritium is introduced into a vacuum space as a drop, and the vacuum space is subsequently irradiated with a laser to generate a very high temperature region therein to

result in the occurrence of a D-T nuclear reaction. The specification of Whittlesey describes that it is necessary to use a plurality of laser irradiations specifically arranged so that a good balance therebetween is maintained, in order to generate its very high temperature region. Further, Whittlesey focuses its disclosure only to a specific energy that is generated by the D-T nuclear reaction, and it does not disclose nor suggest the utility of a reaction product that might be generated by other nuclear reactions including a collection arrangement, as recited in the claims of the instant application.

More particularly, the present invention, as recited in claim 1, differs from the arrangement in Whittlesey, for example, in that a principle for obtaining motion energy for causing a nuclear reaction to occur in some material in accordance with the instant invention is based on a Coulomb explosion of a cluster. As a result, it is not necessary to use a plurality of laser irradiations, as in the Whittlesey arrangement. Additionally, in order to utilize the reaction product generated by nuclear reaction in the instant invention, the radioisotope generation apparatus combination recited in claim 1 includes a collecting section that collects the reaction product. Such arrangements are neither shown, nor even suggested, by Whittlesey.

Applicants respectfully submit that Hedstrom relates to technology in which a pellet, having material including deuterium or tritium inserted into it, is introduced into a vacuum space. The vacuum space is then irradiated with a laser to generate a very high temperature region therein so that a D-T nuclear reaction occurs. More particularly, Hedstrom discloses how to collect generation energy emitted as a motion energy of a neutron. Hedstrom's specification describes technology for effectively picking up energy by utilizing a reaction between a generated neutron and lithium and for performing reproduction of tritium needed as a material.

Applicants respectfully submit that the distinctions discussed above between the instant invention and Whittlesey can also be applied to a traversal of the rejection involving the Hedstrom reference. In Hedstrom, an arrangement which utilizes tritium, a reaction product of lithium and a neutron, is described. However, Applicants respectfully submit that Hedstrom does not teach or suggest disclose a method or arrangement for collecting this reaction product. In the Hedstrom arrangement, the separation of tritium from lithium could be performed by any known means at a later time due to the long half life period of tritium. On the contrary, the arrangement of the present invention, as recited in claim 1, is directed to an arrangement involving the rapid collecting of the reaction product after the subject nuclear reaction. It is apparent that the arrangement recited in the instant application is an indispensable technology in particular when the reaction product has a short half life period.

Accordingly, Applicants respectfully assert that the rejections under 35 U.S.C. § 102(b) should be withdrawn because Whittlesey and Hedstrom, taken separately, do not teach or suggest each feature of independent claim 1. As pointed out in MPEP § 2131, "[t]o anticipate a claim, the reference must teach every element of the claim." Thus, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Verdegaal Bros. v. Union Oil Co. Of California, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987)." Furthermore, Applicants respectfully assert that dependent claim 2 is allowable at least because of the dependence from independent claim 1 and the reasons set forth above.